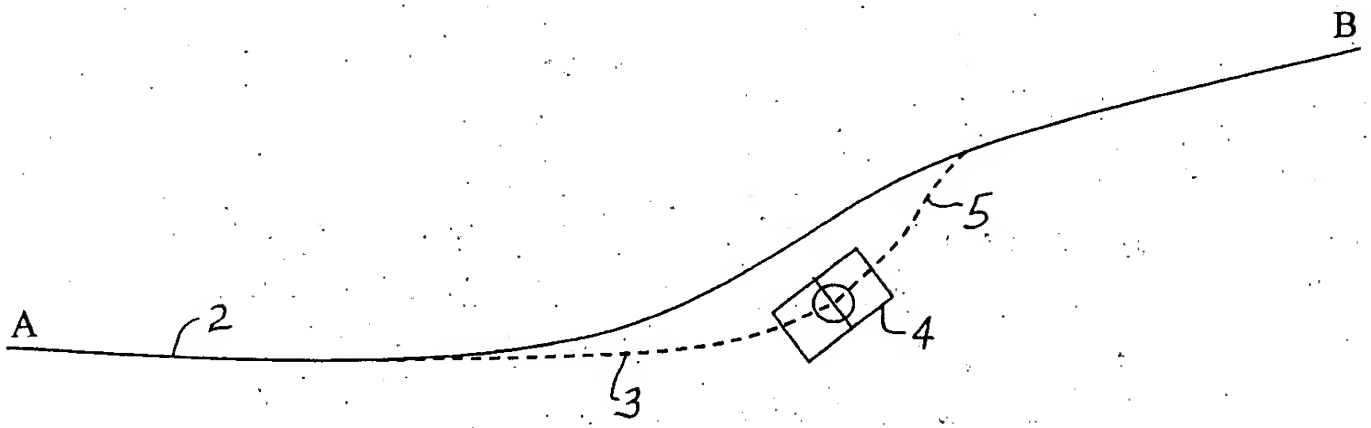

Figure 1

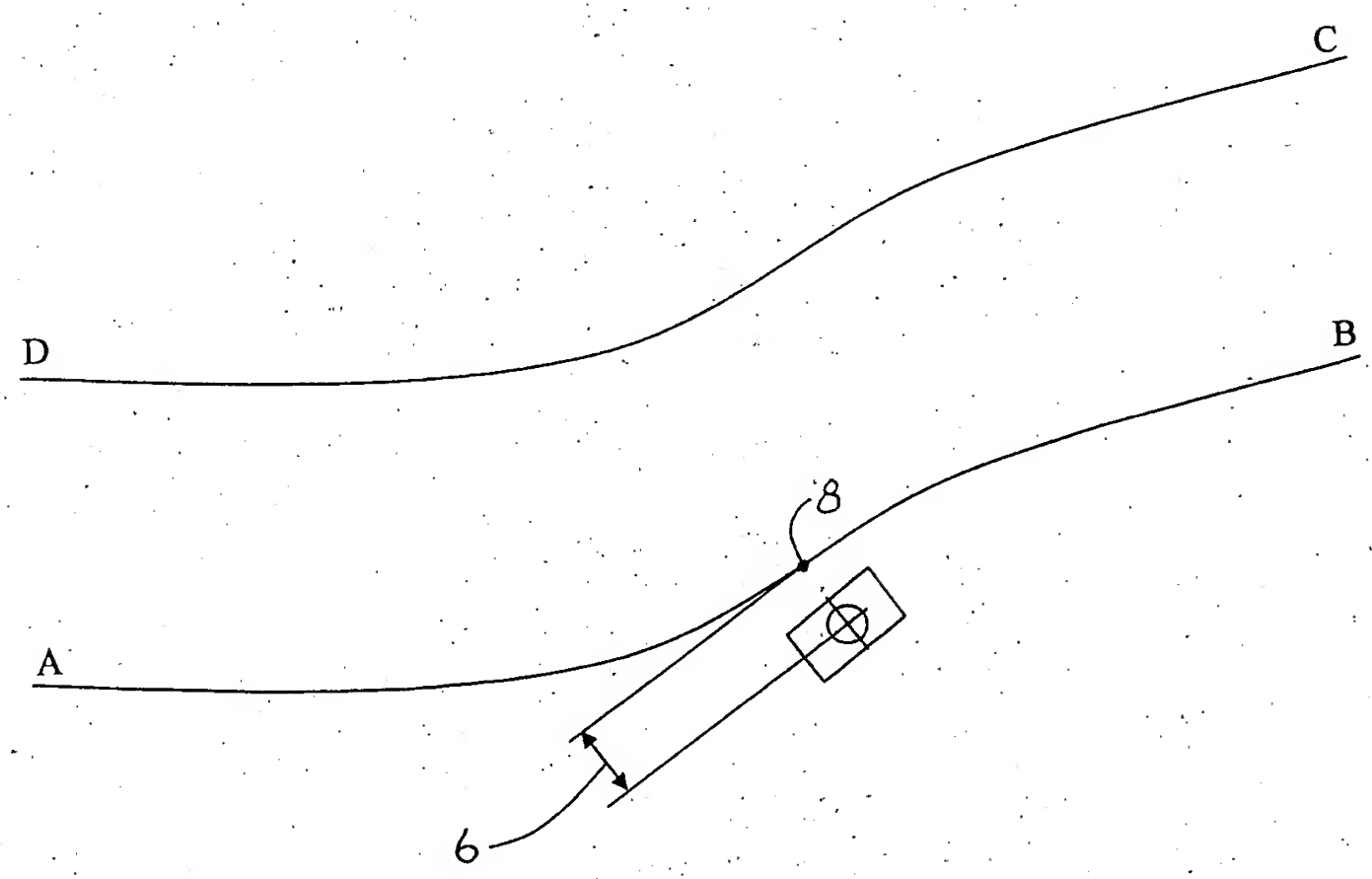

Figure 2

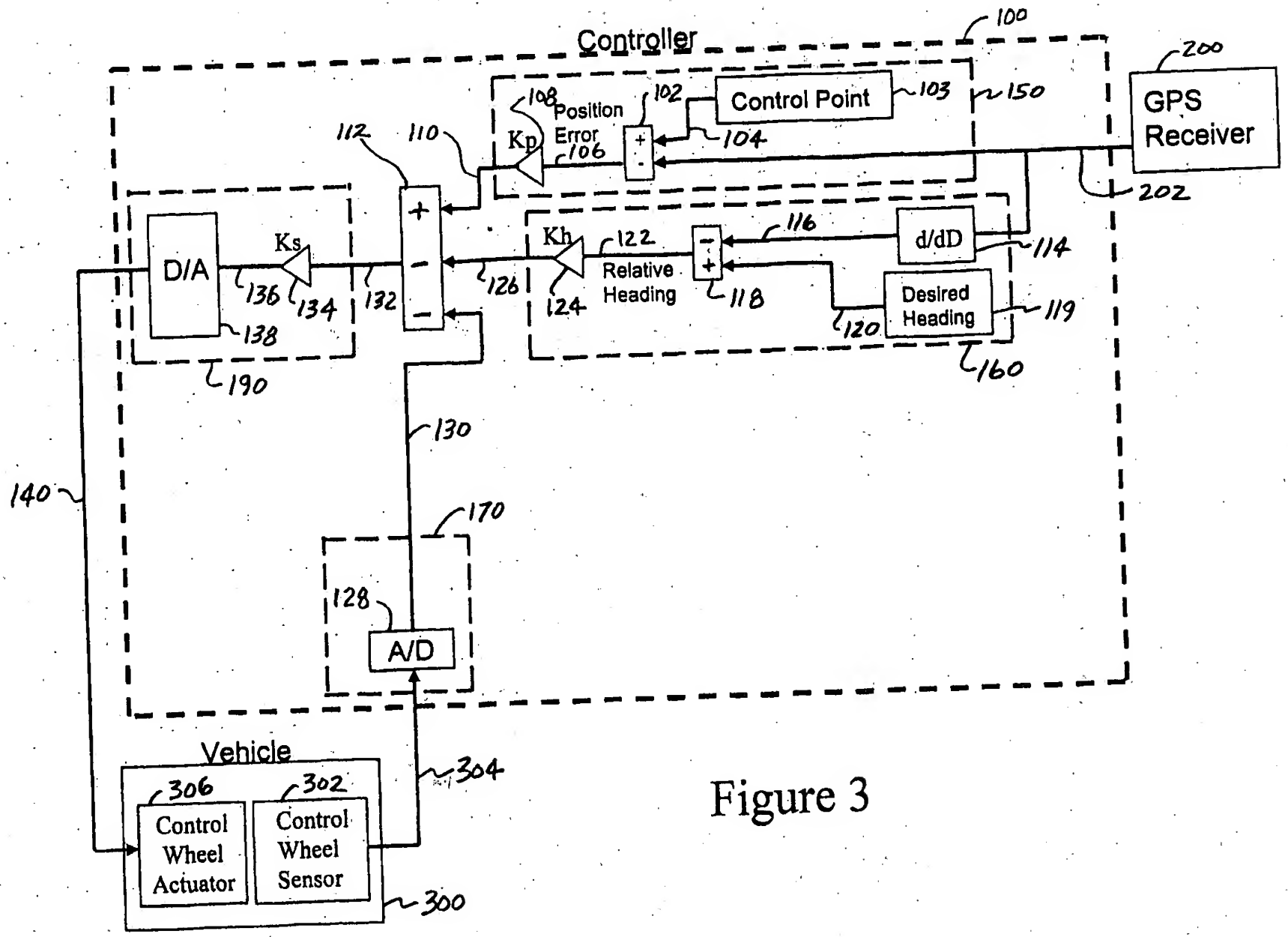
Controller
100
GPS Receiver
200
Control Point
103
150
102
104
108
Position Error
106
Kp
112
110
+
-
202
D/A
Ks
136
134
132
138
190
126
Kh
122
Relative Heading
124
116
d/dD
114
118
Desired Heading
119
120
160
130
140
170
128
A/D
Vehicle
306
302
Control Wheel Actuator
Control Wheel Sensor
304
300

Figure 3

$$T(S) = \frac{Kp * Ks * Kg * Kv}{S^3 * (velocity) + S^2 * (Ks * Kg) + S * (Ks * Kg * Kv * Kh) + (Kp * Kv * Ks * Kg)}$$

Figure 4A

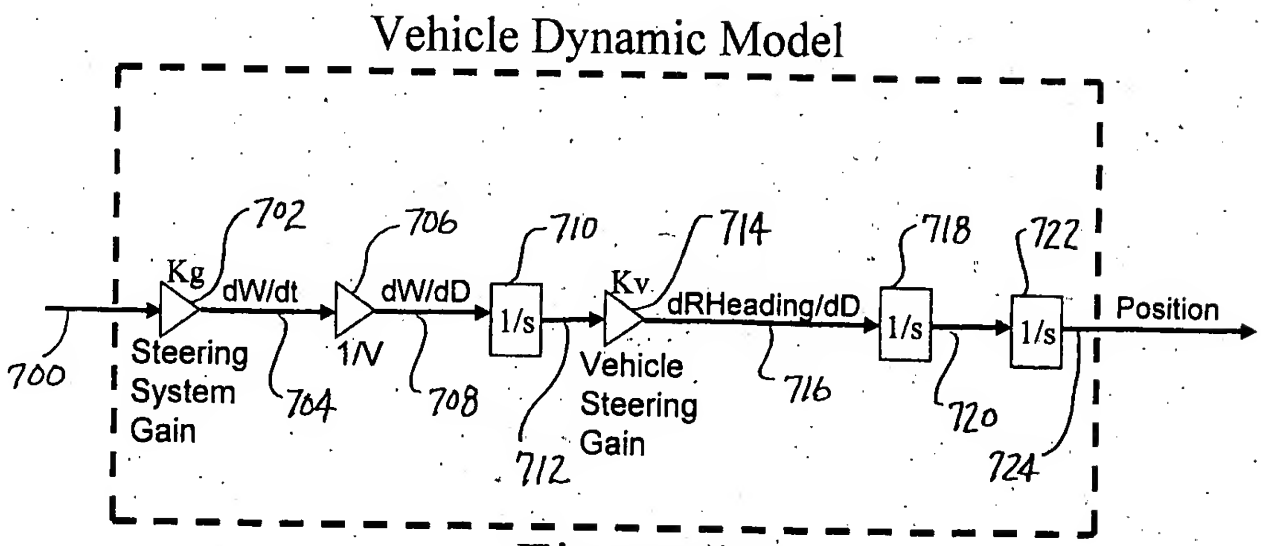

Figure 4B

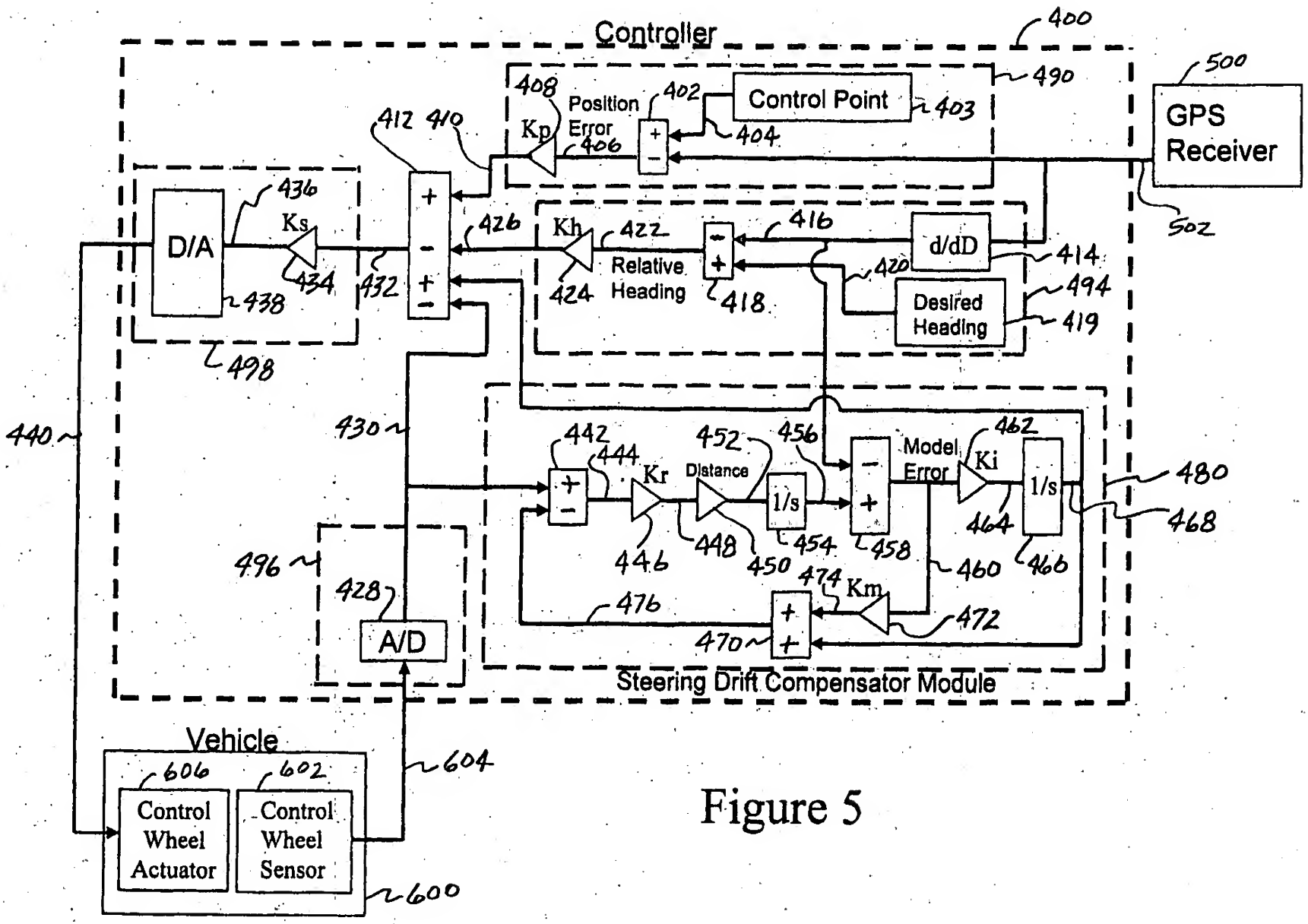
Controller
400
490
500
GPS Receiver
502
Control Point
403
402
404
408
Position Error
406
Kp
412
410
D/A
436
Ks
434
438
498
426
Kh
422
Relative Heading
424
416
418
d/dD
414
420
Desired Heading
494
419
440
430
442
444
Kr
446
Distance
448
450
452
1/s
454
456
458
Model Error
462
Ki
464
1/s
466
480
468
460
474
Km
472
476
470
496
428
A/D
Steering Drift Compensator Module
Vehicle
606
602
604
Control Wheel Actuator
Control Wheel Sensor
600

Figure 5

Figure 6

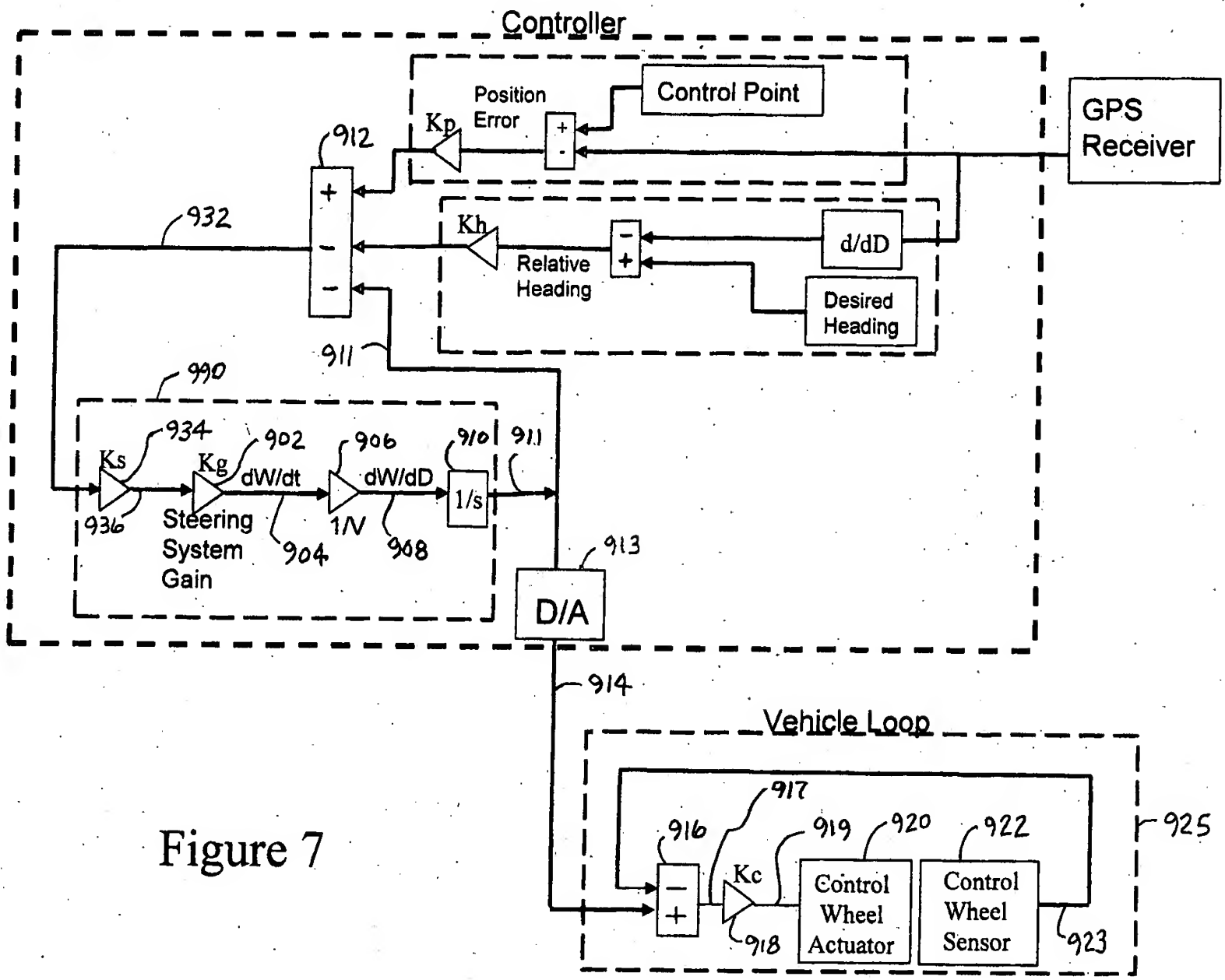
Controller
Control Point
Position Error
Kp
912
GPS Receiver
932
Kh
d/dD
Relative Heading
Desired Heading
911
990
934
902
906
910
911
Ks
Kg
dW/dt
dW/dD
1/s
936
Steering System Gain
904
1/V
908
913
D/A
914
Vehicle Loop
917
916
919
920
922
925
Kc
Control Wheel Actuator
Control Wheel Sensor
918
923

Figure 7

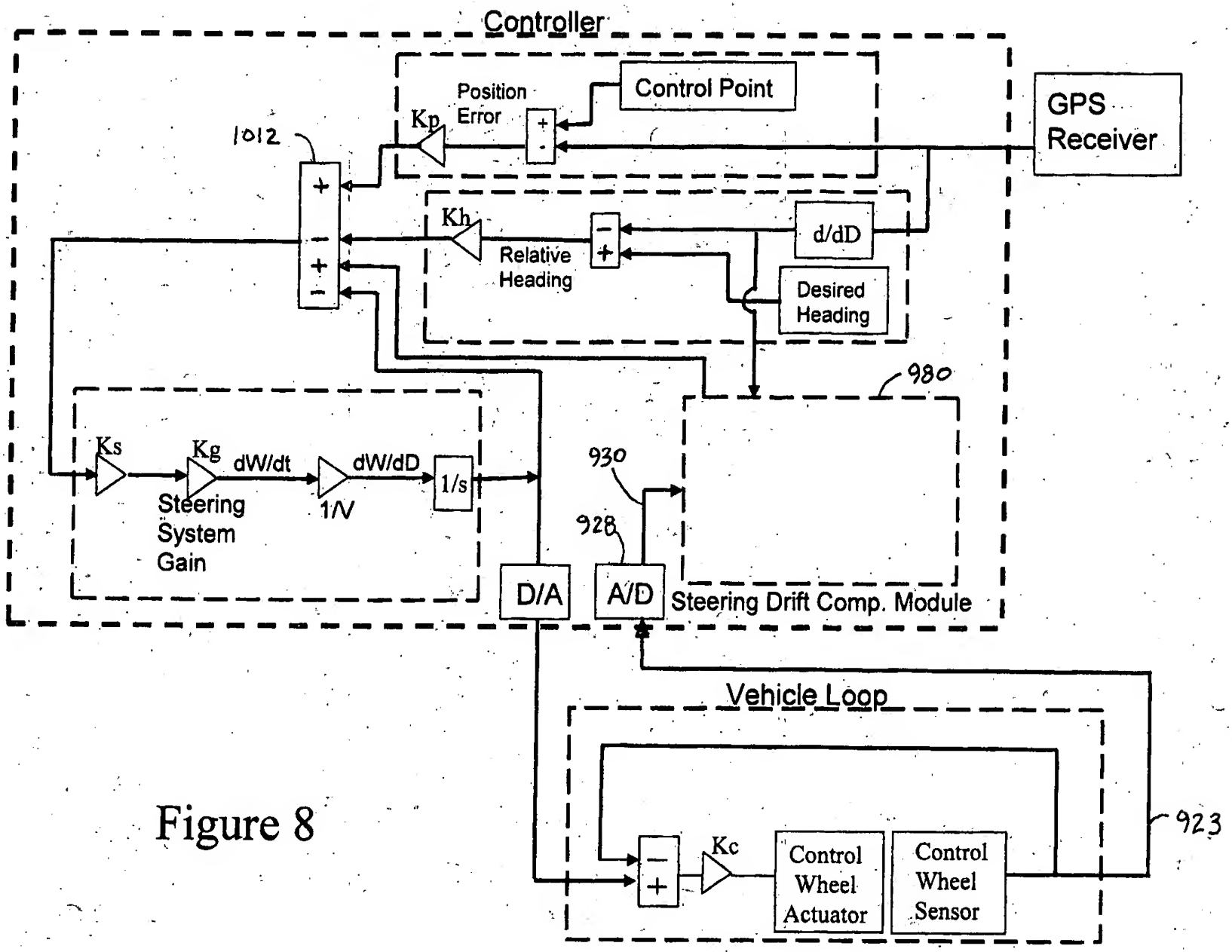
Controller
Control Point
Position Error
Kp
1012
GPS Receiver
Kh
Relative Heading
d/dD
Desired Heading
980
Ks
Kg
dW/dt
dW/dD
1/s
Steering System Gain
1/V
930
928
D/A
A/D
Steering Drift Comp. Module
Vehicle Loop
Kc
Control Wheel Actuator
Control Wheel Sensor
923

Figure 8